



Atlas Curriculum Mapping: Unit Calendar
Shanghai American School
Chao, Michael / IB Math HL Year 1 / Grade 11 (Pudong High School)



Unit:	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Functions	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38										
Sequences, Series, and Combinatorics											
Trigonometry											
Differential Calculus											
Differential Calculus -- applications											
Integral Calculus											
Integral Calculus -- applications											
Probability I											

Last Updated: February 8, 2009

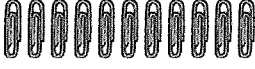

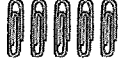
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


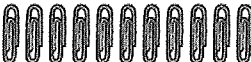
Curriculum Map 2008-2009
Shanghai American School
Chao, Michael / IB Math HL Year 1 / Grade 11 (Pudong High School)




Content - Understandings and Knowledge	EAGLES	Essential Questions	Objectives (Skills)	Assessment	Instructional Strategies	Resources Including Technology	Reflections
Functions (Week 1, 5 Weeks)	A. Understandings <ul style="list-style-type: none">● Familiarity with a variety of types of functions and their properties allows us to describe a wide range of phenomena and situations.● Transformations can be applied to reflect, shift, and stretch the graphs of functions while preserving certain key properties.B. Knowledge<ul style="list-style-type: none">● domain, range● inverse functions -- including domain restrictions● quadratic functions -- vertex, axis of symmetry, completing the square, discriminant● exponential and logarithmic functions -- properties, graphs, equations, applications● transformations of functions -- translations, dilations, reflections, absolute value, quotients● complex numbers -- basic operations, complex conjugates,	Classroom Work Empowered <ul style="list-style-type: none">● to interact with the world around them Adaptable <ul style="list-style-type: none">● problem solvers, negotiators and collaborators Literate <ul style="list-style-type: none">● Individuals who can analyze information to create new knowledge and develop understandings● Individuals who can use information and communication technologies effectively● Individuals who communicate articulately through reading, writing, speaking, listening, and artistic expression Skilled <ul style="list-style-type: none">● Inquirers who reason soundly and critically● Inquirers who strive for academic excellence.● Inquirers who apply content knowledge and skills to authentic situations and	1. What characteristics/properties are important for the study of functions, regardless of type? 2. What characteristics/properties are used to define or distinguish particular types of functions?	Formative: Group Work Class assignments -- see attachments	The bulk of most classes has been class work in pairs, with assignments divided into 3 sections: Review (things I expect the students to have mastered already), Review?? (things I expect the students to be familiar with, but not necessarily to have mastered), and Extension. This strategy suits the initial part of the course, in which most of the major concepts are familiar to the students, but where they will have to extend their understanding to more advanced problems/applications. During each class, we also discuss selected problems as a larger group.	Textbooks: 1. Main text -- Paul Urban, John Owen, David Martin, Robert Haese, Sandra Haese, and Mark Bruce, <i>Mathematics for the International Student</i> , <i>Mathematics HL (Core)</i> , Haese and Harris Publications, Adelaide, Australia, 2004, ISBN 1-876543-09-4. 2. Supplementary text -- Bill Roberts, and Sandy Mackenzie, <i>Mathematics Higher Level for the IB Diploma</i> , Oxford University Press, Oxford, UK, 2007, ISBN-13: 978-0-19-915226-1 Handouts -- see attachments in Assessment section	Overall, I feel this class is off to a good start. There are a couple students whose enthusiasm for learning is helping to set a good tone for the class overall. A few students are also getting in to a good routine of seeing me outside of class when they have questions. I am happy with a couple changes made in comparison to the last time I taught the class a couple years ago. First, the organization of CW into Review, Review?? and Extension seems to provide a good framework for working on the Precalc-ish topics of the course, and for students to assess their own understanding. Second, the tuition mini-project gives us a good springboard for further work in mathematical modeling. I like the idea of trying to build skills needed for successful IB portfolio work, rather than just doing a practice one or two.
				Formative: Other Written Assessments Homework			
				Diagnostic: Technology Project Mini-project on mathematical modeling using data on public college tuition and fees in the US -- used to assess students' backgrounds in using mathematical functions to model data			
				Summative: Quiz			
				Summative: Written Test			

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<p>complex roots!</p> <ul style="list-style-type: none">polynomial functions --zeros and rootspolynomial division, including synthetic divisionRemainder, Factor, and Rational Root Theorems	broader systems		equation to a set of data, and use the properties of functions to comment on the suitability of various models				
<p>Sequences, Series, and Combinatorics  (Week 6, 3 Weeks)</p> <p>A. Understandings</p> <ul style="list-style-type: none">Arithmetic sequences and series are used to model situations in which successive terms have a constant difference.Geometric sequences and series are used to model situations in which successive terms have a constant ratio.Under certain conditions, an infinite geometric series can be said to converge to a particular sum.Combinations and permutations and variations can be used to enumerate the number of possibilities in a range of situations. <p>B. Knowledge</p> <ul style="list-style-type: none">Arithmetic sequences and series	<p>Classroom Work</p> <ul style="list-style-type: none">Adaptable<ul style="list-style-type: none">resilient, flexible, self-motivated learnersproblem solvers, negotiators and collaboratorsSkilled<ul style="list-style-type: none">Inquirers who reason soundly and criticallyInquirers who strive for academic excellence.	<p>1. How can an infinite number of numbers have a finite sum?</p> <p>2. What does $(a + b)^n$ have to do with the number of committees you can form from a group of people?</p>	<p>1. Determine specific terms or finite sums of arithmetic and geometric sequences</p> <p>2. Determine the sum of a convergent infinite geometric series</p> <p>3. Enumerate the number of possibilities in a situation using combinatorial reasoning</p> <p>4. Use the Binomial Theorem to expand powers of binomials, or to determine specific terms of these expansions</p>	<p>Summative: Written Test</p> <p>In-class test with both calculator and non-calculator sections</p> <p>Formative: Group Work</p> <p>class assignments -- see attachments</p> <p>Formative: Observation</p> <p>Formative: Other Written Assessments</p> <p>Homework</p> 	<p>Similar to Functions unit, with class assignments divided into 3 sections:</p> <p>Review (things I expect the students to have mastered already), Review?? (things I expect the students to be familiar with, but not necessarily to have mastered), and Extension. During each class, we also discuss selected problems as a larger group.</p>	<p>Textbooks:</p> <p>1. Main text -- Paul Urban, John Owen, David Martin, Robert Haese, Sandra Haese, and Mark Bruce.</p> <p><i>Mathematics for the International Student</i>.</p> <p><i>Mathematics HL (Core)</i>, Haese and Harris Publications, Adelaide, Australia, 2004, ISBN 1-876543-09-4.</p> <p>2. Supplementary text -- Bill Roberts, and Sandy Mackenzie, Mathematics Higher Level for the IB Diploma, Oxford University Press, Oxford, UK, 2007, ISBN-13: 978-0-19-915226-1</p> <p>Handouts -- see attachments in Assessment section</p> <p>Technology:</p> <p>TI graphing calculators are used almost every day.</p>	<p>This unit has felt choppy -- it seems like we've rarely had everyone there together, and there have been a lot of interruptions --</p> <p>Habitat, October Break, PSAT, my IB Conference. Given all that, the students are doing pretty well, though not as well as I believe they would have had things been smoother.</p> <p>From the start of the year, I have struggled with making enough time for the Extension problems, which after all, are really key for this HL class. I may have had my Eureka moment during the IB Conference. This is exactly where I should be using some kind of Web-based discussion board, maybe a wiki? Something to try for next unit.</p>

Content - Understandings and Knowledge	EAGLES	Essential Questions	Objectives (Skills)	Assessment	Instructional Strategies	Resources Including Technology	Reflections
<ul style="list-style-type: none">• Geometric sequences and series• Infinite geometric series, including conditions for convergence• Product principle for enumeration• Combinations and permutations, including permutations with repetition and circular permutations• Pascal's Triangle• Binomial Theorem							
Trigonometry  (Week 9, 4 Weeks)	A. Understandings <ul style="list-style-type: none">• Trigonometry is the primary mathematical tool used in the study of periodic phenomena.• The unit circle is the conceptual bridge between geometric trigonometry and the study of trigonometric functions.• Knowledge of trigonometry -- Case (review) Law of Cosines, Law of Sines, Ambiguous Case (review) -- functions and graphs -- amplitude, period, phase shift• Other trig functions and	Classroom Work <ul style="list-style-type: none">Empowered<ul style="list-style-type: none">• to interact with the world around them• to demonstrate leadership through collaboration and teamworkAdaptable<ul style="list-style-type: none">• resilient, flexible, self-motivated learners• problem solvers, negotiators and collaboratorsGlobally minded<ul style="list-style-type: none">• Citizens who engage responsibly in the world's problems• Citizens who protect and advocate for local and global	<ul style="list-style-type: none">• Solve (for the missing sides and angles of) triangles, using the Law of Cosines and/or Law of Sines, including the Ambiguous Case• Explain how the sine and cosine functions are derived from the unit circle as circular functions• Analyze the properties of trigonometric and inverse trigonometric functions• Sketch the graphs of trigonometric and inverse trigonometric functions• Solve trigonometric	Summative: Quiz Formative: Observation Formative: Group Work In-class assignments -- see attachments Formative: Other Written Assessments Homework Summative: Written Test Summative: Technology Project Mini-project on mathematical modeling using data on	As in the first two units, classes were centered around small-group work, with the class pulled together for discussions about key concepts or particular problems or problem-solving techniques. There was one very different type of activity -- a unit circle trig game based on the game Spoons. We passed a milestone partway through this unit (starting with Trig Equations), leaving aside the Review / Extension??? organization that was used extensively for the first two-and-a-half units. This was an indication that we reached material that was new for most of	Textbooks: 1. Main text -- Paul Urban, John Owen, David Martin, Robert Haese, Sandra Haese, and Mark Bruce, <i>Mathematics for the International Student, Mathematics HL (Core)</i> , Haese and Harris Publications, Adelaide, Australia, 2004, ISBN 1-876543-09-4. 2. Supplementary text -- Bill Roberts, and Sandy Mackenzie, <i>Mathematics Higher Level for the IB Diploma</i> , Oxford University Press, Oxford, UK, 2007, ISBN-13: 978-0-19-915226-1 Handouts -- see attachments in Assessment section Technology:	After the chopiness of Unit 2, this unit had relatively few disruptions in terms of the calendar, and went much more smoothly. I feel that I did a better job than in the past helping students see the connections between the different strands of trig -- triangles/geometry, unit circle, and analytic trig -- functions, equations, identities. The students commented that the test did not seem as difficult to them: I hope this is a reflection that we managed better to work at varying levels of difficulty

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<p>graphs</p> <ul style="list-style-type: none">• Inverse trig functions and graphs• Trig equations• Trig identities -- Pythagorean, sum and difference, double angle, verifying identities• Compound formula ($a \sin x + b \cos x = r \cos (x + q)$)	<p>environments</p> <p>Literate</p> <ul style="list-style-type: none">• Individuals who can analyze information to create new knowledge and develop understandings• Individuals who can use information and communication technologies effectively• Individuals who communicate articulately through reading, writing, speaking, listening, and artistic expression <p>Skilled</p> <ul style="list-style-type: none">• Inquirers who reason soundly and critically• Inquirers who strive for academic excellence.• Inquirers who apply content knowledge and skills to authentic situations and broader systems	<p>1. How do you find the slope of a curve?</p> <p>2. What mathematical tools do we need to study applications involving rates of change?</p>	<p>equations</p> <ul style="list-style-type: none">• Prove trigonometric identities• Apply trigonometric functions to model real-life periodic phenomena	<p>carbon dioxide levels in the atmosphere -- used to assess students' backgrounds in using mathematical functions to model data, their ability to combine different types of functions, and to connect the mathematics of the unit to global environmental concerns</p> 	<p>the students, those coming from Algebra 2/Trig rather than Precalc.</p>	<p>TI graphing calculators are used almost every day.</p>	<p>throughout the unit.</p>
<p>A. Understandings</p> <ul style="list-style-type: none">• The derivative represents the slope of a function at any point.• Differential calculus is the primary	<p>Classroom Work Empowered</p> <ul style="list-style-type: none">• to be life-long learners <p>Adaptable</p> <ul style="list-style-type: none">• resilient, flexible, self-motivated	<p>1. Interpret the derivative of a function as its slope or as a rate of change in various contexts.</p> <p>2. Determine the derivative of a</p>	<p>Formative: Group Work</p> <p>In-class assignments -- see handouts</p>	<p>As in the first three units, classes were centered around small-group work, with the class pulled together for discussions about key</p>	<p>Textbooks:</p> <p>1. Main text -- Finney, Demana, Waits, and Kennedy, Calculus: Graphical, Numerical, Algebraic, 3rd edition, Pearson/Prentice</p>	<p>It's a pleasure to reach this part of the course with this group. Since Calculus is new to all of the students (except Jessie who had a summer introductory</p>	

Content - Understandings and Knowledge	EAGLES	Essential Questions	Objectives (Skills)	Assessment	Instructional Strategies	Resources Including Technology	Reflections
<p>mathematical tool for applications involving instantaneous rates of change.</p> <p>B. Knowledge</p> <ul style="list-style-type: none"> Derivatives from first principles Derivative rules -- power, product, quotient, chain, etc. Derivatives of common functions Tangent and normal lines Velocity and acceleration as derivatives 	<p>learners</p> <ul style="list-style-type: none"> problem solvers, negotiators and collaborators <p>Literate</p> <ul style="list-style-type: none"> Individuals who can analyze information to create new knowledge and develop understandings Individuals who communicate articulately through reading, writing, speaking, listening, and artistic expression <p>Skilled</p> <ul style="list-style-type: none"> Inquirers who reason soundly and critically Inquirers who strive for academic excellence. Inquirers who apply content knowledge and skills to authentic situations and broader systems 	<p>function from first principles.</p> <p>3. Calculate the derivatives of common functions and combinations of functions.</p> <p>4. Use derivatives to solve problems involving tangent and normal lines.</p> <p>5. Differentiate implicitly to find the slope of a graph whose function is not explicitly given.</p> <p>6. Use derivatives to solve problems involving motion in one dimension.</p>	<p>Formative: Observation</p> <p>Summative: Quiz</p> <p>Summative: Written Test</p> <p>Formative: Other Written Assessments</p> <p>Homework</p> 	<p>concepts or particular problems or problem-solving techniques.</p>	<p>Hall, Boston, USA, 2007, ISBN 0-13-201408-4</p> <p>2. Supplementary text -- Paul Urban, John Owen, David Martin, Robert Haese, Sandra Haese, and Mark Bruce, <i>Mathematics for the International Student, Mathematics HL (Core)</i>, Haese and Harris Publications, Adelaide, Australia, 2004, ISBN 1-876543-09-4.</p> <p>3. Supplementary text -- Bill Roberts, and Sandy Mackenzie, <i>Mathematics Higher Level for the IB Diploma</i>, Oxford University Press, Oxford, UK, 2007, ISBN-13: 978-0-19-915226-1</p> <p>Handouts -- see attachments in Assessment section</p> <p>Technology:</p> <p>TI graphing calculators are used almost every day.</p>	<p>course), there are more moments of true discovery ("aha" moments) than in earlier parts of the course. As a group, the students have done quite well with Calculus thus far, as evidenced by the fact that the quiz and test did not require the "IB curve" for grading. One student has gotten out of the habit of coming for extra help, and I need to get on him about continuing to do this.</p> <p>During this unit, I switched to the AP Calculus text as the main text. This is partly due to the decision to allow students in the class to write the AP Calculus AB exam as independent study students (6 out of 9 have opted to do so), but I prefer the organization of this book for calculus anyway. I also believe that it will benefit the students to have the emphasis on different representations, and the more conceptual and interpretive questions that this text offers, in addition to the purely computational ones.</p>	